

Application No. 09/758,606
Filed: January 11, 2001
TC Art Unit: 2644
Confirmation No.: 9889

REMARKS

The instant Amendment is filed in response to the official action dated December 24, 2003. Reconsideration is respectfully requested.

The status of the claims is as follows:

Claims 1-26 are currently pending.

Claims 1-26 stand rejected.

Claims 1, 5-6, 10-11, 15, and 20-21 have been amended.

Claim 27 has been added.

The Examiner has rejected claims 1 and 12 under 35 U.S.C. 102(a) as being anticipated by Norris (USP 5,885,129). Specifically, the official action indicates that the Norris reference discloses a parametric speaker including an ultrasonic frequency generator, a sonic frequency generator, a modulator, transducers, and means for applying a modulated carrier to the transducer, which emits a 5 kHz sonic compression wave at a target.

The cited Norris reference discloses a toy including a parametric speaker that generates a new sonic frequency from two ultrasonic frequencies of different value, and projects them toward a target area. As disclosed by Norris, the new sonic signal, which has a frequency equal to 5 kHz, is de-coupled when

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it is emitted within the air. As a result, when the user aims the toy at the target and engages the parametric speaker, the toy subsequently emits a 5 kHz sonic compression wave at the target (see column 2, lines 1-8, and column 3, lines 50-65, of Norris).

The Applicant respectfully submits that the Norris reference does not describe each and every element of amended claim 1 and claim 12 and therefore does not anticipate the rejected claims. For example, amended claim 1 recites a parametric audio system for generating an airborne audio beam including an audio signal source for providing an audio signal, a signal conditioner for receiving the audio signal and for nonlinearly processing the audio signal to provide a pre-distorted signal, a modulator for receiving the pre-distorted signal and for converting the pre-distorted signal into ultrasonic frequencies, and an acoustic transducer array for receiving the converted signal and for projecting the converted signal through the air along a selected path, thereby inverting distortion in the projected signal and regenerating the audio signal along a portion of the selected path with reduced net distortion (see, e.g., page 7, line 27, to page 8, line 2, of the application). Amended claim 1 further recites that the acoustic transducer array has a bandwidth greater than 5 kHz (see page 10, lines 9-12, of the application).

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Accordingly, the parametric audio system of amended claim 1 is configured and arranged such that the acoustic bandwidth available for transmission of the pre-distorted signal through the air is broad, i.e., greater than 5 kHz. The parametric audio system employs the signal conditioner to reduce or eliminate distortion in the reproduced audio. Further, the pre-distorted signal provided by the signal conditioner generally expands the need for ultrasonic bandwidth (see page 6, lines 21-25, of the application).

The parametric audio system recited in base claim 1 is significantly different from the toy disclosed by Norris. Specifically, the parametric audio system of claim 1 includes an acoustic transducer array having a bandwidth greater than 5 kHz, thereby providing a broad acoustic bandwidth for transmission of the pre-distorted sound beam through the air. In contrast, the toy disclosed by Norris is capable of emitting a sonic compression wave having a frequency equal to 5 kHz. Unlike the instant application, Norris discloses nothing about the acoustic bandwidth available for transmission of the sonic compression wave through the air. In addition, the Norris reference neither teaches nor suggests pre-distorting a sound beam before emitting the sound beam through the air for subsequent de-coupling of a new sonic

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signal. As described in the instant application, the audible sound generated by the disclosed non-linear parametric process is approximately proportional to the square of the modulation envelope (see page 7, lines 24-27, of the application).

Accordingly, to reduce distortion in the audible sound, the signal conditioner recited in amended claim 1 may include nonlinear inversion circuitry (see also amended claim 10) for pre-distorting the audio signal and for subsequently inverting the distortion that would otherwise result in the regenerated audible signal (see page 7, lines 24-31, of the application). In this way, audio signals are reproduced with reduced distortion and signal loss (see, e.g., page 3, lines 10-12, of the application).

The Applicant respectfully points out that the cited Beard reference (USP 4,169,219) does not disclose nonlinear inversion circuitry for pre-distorting an audio signal, as recited in amended claim 10, but instead merely discloses a volume control circuit for post-processing of signals.

Unlike the instant application, the Norris reference is completely unconcerned with reducing distortion in airborne audio beams. As described above, the Norris device is a toy that includes a parametric speaker. Norris discloses that the purpose of the parametric speaker is to allow the user to hear the sounds

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that the toy sends toward the target. Such sounds may include various bursts, bangs, hums, whistles, sirens, swishes, and buzzes useful to simulate a weapon (see column 4, lines 12-14, of Norris). Clearly, the typical user of the Norris toy would probably not be troubled if the bursts, bangs, hums, whistles, sirens, swishes, and buzzes generated by the toy included some distortion. In fact, such distortion in the sound generated by the Norris toy might even enhance the user's enjoyment. As described in the instant application, an important object of the parametric audio system of claim 1 is to reduce distortion in airborne audio signals. The Applicant achieves this end by employing a signal conditioner for suitably pre-distorting the audio signal, and acoustic transducer array having a bandwidth greater than 5 kHz for projecting the pre-distorted signal through the air, as recited in amended claim 1.

Because the Norris reference neither teaches nor suggests providing a parametric audio system including a signal conditioner for pre-distorting an audio signal, and an acoustic transducer array having a bandwidth greater than 5 kHz for projecting the pre-distorted signal through the air for subsequent regeneration of the audio signal, as recited in amended claim 1, the Norris reference does not anticipate amended claim 1 and the claims

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dependent therefrom. Accordingly, the Applicant respectfully submits that the rejections of claims 1 and 12 under 35 U.S.C. 102 are unwarranted and should be withdrawn.

The Examiner has rejected claims 2-4 and 8-9 under 35 U.S.C. 103(a) as being unpatentable over Norris in view of Kuhl et al. (ACUSTICA, Vol. 4, 1954, No. 5, "Condenser Transmitters and Microphones with Solid Dielectric for Airborne Ultrasonics"). The Applicant respectfully asserts, however, that the Kuhl reference does not cure the deficiencies of the Norris reference, and therefore the suggested combination of the Norris and Kuhl references does not render claims 2-4 and 8-9 obvious. Notwithstanding the above assertion, the mere fact that the Kuhl reference was published 45 years before the publication of the Norris reference is a secondary consideration that may be construed as evidence against any holding that it would have been obvious to combine the teachings of the two references to obtain the claimed subject matter. The Applicant points out that active research in the field of airborne ultrasonics continued unabated throughout the 45 years between the publications of the Kuhl and Norris references without the appearance of the claimed invention. Accordingly, the Applicant respectfully submits that the

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rejections of claims 2-4 and 8-9 under 35 U.S.C. 103 are unwarranted and should be withdrawn.

The Examiner has rejected claim 5 under 35 U.S.C. 103(a) as being unpatentable over Norris in view of Kuhl et al. as applied to claims 2-4 and 8-9 above, and further in view of Hirayanagi (USP 6,445,804) and Nakamura (JP 54034662). The Applicant respectfully asserts, however, that the Hirayanagi and Nakamura references do not cure the deficiencies of the Norris and Kuhl references, and therefore the suggested combination of the Norris, Kuhl, Hirayanagi, and Nakamura references does not render claim 5 obvious. Notwithstanding the above assertion, the mere fact that the Nakamura reference was published 20 years before the publication of the Norris reference is a secondary consideration that may be construed as evidence against any holding that it would have been obvious to combine the teachings of the cited references to obtain the claimed subject matter. Accordingly, the Applicant respectfully submits that the rejection of claim 5 under 35 U.S.C. 103 is unwarranted and should be withdrawn.

The Examiner has rejected claims 6 and 15-17 under 35 U.S.C. 103(a) as being unpatentable over Norris in view of Kuhl et al. as applied to claims 2-4 and 8-9 above, and further in view of Babcock et al. (USP 3,565,209). The official action indicates

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that base claim 15 is essentially similar to claims 1 and 6, and is rejected for the reasons stated apropos claims 1 and 6. Specifically, the official action indicates that the combination of the Norris and Kuhl references discloses all of the elements of claim 15 except for a first component coupled between the acoustic transducer array and the DC bias source and configured to block the amplified signal from the DC bias source. The official action goes on to indicate that such a first component is disclosed in the Babcock reference, and therefore the combination of the Norris, Kuhl, and Babcock references would render claim 15 obvious.

The Applicant points out, however, that to consider the subject matter "as a whole" under section 103 of the Patent Laws affirmatively involves taking into account all of the limitations of a claim. Because the analysis contained in the official action failed to take into account all of the limitations of claim 15, the rejection of claim 15 is improper and should be withdrawn.

Specifically, the official action failed to take into account the limitation that a resonant circuit is formed by the inductor of the driver amplifier coupled to the capacitive load of the acoustic transducer array, in which the resonant circuit has a resonance frequency approximately equal to the frequency of the

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ultrasonic carrier signal, as recited in base claim 15. The resonant circuit described above significantly reduces the power required to drive the claimed parametric audio system (see page 14, line 27, to page 15, line 2, of the application).

In contrast, Babcock et al. merely discloses a choke 19 that prevents the output current from an amplifier 12 from flowing through a bias voltage source 14 (see column 2, lines 70-72, and Fig. 2, of Babcock et al.). The Babcock reference discloses nothing about forming a resonant circuit by coupling an inductor of a driver amplifier to a capacitive load of an acoustic transducer array, such that the resonant circuit has a resonance frequency approximately equal to the frequency of an ultrasonic carrier signal, as recited in claim 15. Moreover, the Norris and Kuhl references fail to cure the deficiencies of the Babcock reference.

Accordingly, the Applicant asserts that even if the Norris, Kuhl, and Babcock references were combined as suggested in the official action, the resulting combination would not render base claim 15 and the claims dependent therefrom obvious. The Applicant therefore respectfully submits that the rejections of claim 15 and the claims dependent therefrom under 35 U.S.C. 103 are unwarranted and should be withdrawn.

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The Examiner has rejected claims 20-22 and 24 under 35 U.S.C. 103(a) as being unpatentable over Norris in view of Kuhl et al. as applied to claims 2-4 and 8-9 above, and further in view of Hirayanagi and Beaver (USP 4,005,382). The Applicant has amended base claim 20 to include a signal conditioner for pre-distorting the audio signal, and an acoustic transducer array having a bandwidth greater than 5 kHz for projecting the pre-distorted signal. Because the Norris reference neither teaches nor suggests providing a parametric audio system including a signal conditioner for providing a pre-distorted audio signal, and an acoustic transducer array having a bandwidth greater than 5 kHz for projecting the pre-distorted signal through the air to regenerate the audio signal with reduced net distortion, and the Kuhl, Hirayanagi, and Beaver references do not cure the deficiencies of the Norris reference, the suggested combination of the Norris, Kuhl, Hirayanagi, and Beaver references does not render base claim 20 and the claims dependent therefrom obvious. Accordingly, the Applicant respectfully submits that the rejections of base claims 20 and the claims dependent therefrom under 35 U.S.C. 103 are unwarranted and should be withdrawn.

The official action indicates that base claim 25 is essentially similar to claims 20 and 22-23 and is therefore

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rejected for the reasons stated *apropos* claims 20 and 22-23. The Applicant respectfully submits, however, that the official action failed to take into account all of the limitations of claim 25, and therefore the rejections of claims 25 and the claims dependent therefrom are improper and should be withdrawn.

Specifically, the official action failed to take into account the following elements and limitations recited in base claim 25: (1) the backplate having the plurality of respective depressions of varying dimensions formed on a surface thereof, (2) the membrane adjacently disposed along the backplate, (3) the membrane and at least one of the respective depressions defining at least one acoustic transducer, and (4) the dimensions of the respective depressions being set to determine the center frequency and the bandwidth of the at least one acoustic transducer. The Applicant respectfully submits that none of the cited Norris, Kuhl, Hirayanagi, and Beaver references discloses these elements and limitations, as recited in base claim 25.

Accordingly, the Applicant asserts that even if the Norris, Kuhl, Hirayanagi, and Beaver references were combined as suggested in the official action, the resulting combination would not render base claim 25 and the claims dependent therefrom obvious. The Applicant therefore respectfully submits that the rejections of

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claim 25 and the claims dependent therefrom under 35 U.S.C. 103 are unwarranted and should be withdrawn.

In view of the foregoing, it is respectfully submitted that the present application is in a condition for allowance. Early and favorable action is respectfully requested.

The Examiner is encouraged to telephone the undersigned Attorney to discuss any matter that would expedite allowance of the present application.

Respectfully submitted,

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